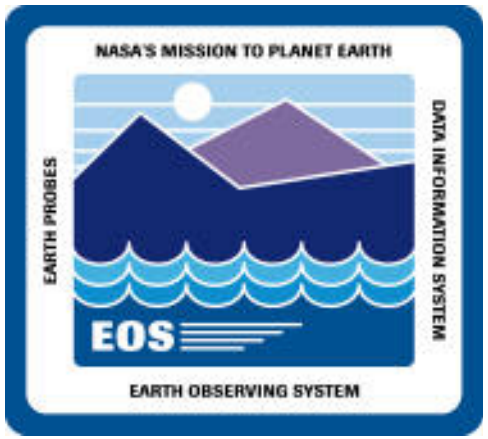
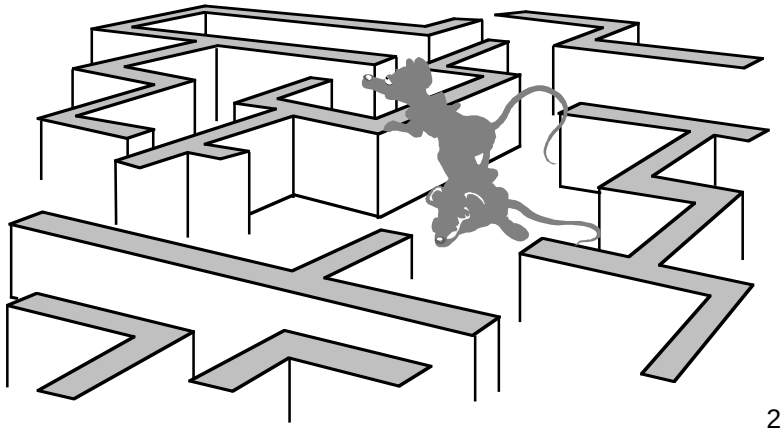


SYSTEM TROUBLESHOOTING

ECS Pre-Release B Testbed Training

Overview of Lesson

- **Introduction**
- **System Troubleshooting Topics**
  - **System Performance Monitoring**
  - **Problem Analysis/Troubleshooting**
  - **Trouble Ticket (TT)**
  - **Diagnosing Network Communications Problems**
- **Practical Exercise**



Objectives

- **Overall: Proficiency in methodology and procedures for system troubleshooting for ECS**
  - **Conduct system performance monitoring**
  - **Perform problem analysis and troubleshooting**
  - **Set up trouble ticket users and configuration**
  - **Diagnose network communications problems**

Objectives (Cont.)

Lesson helps prepare several ECS roles for effective system troubleshooting, maintenance, and problem resolution:

- **DAAC Computer Operator, System Administrator, and Maintenance Coordinator**
- **SEO System Administrator, System Engineer, System Test Engineer, and Software Maintenance Engineer**
- **DAAC System Engineers, System Test Engineers, Maintenance Engineers**

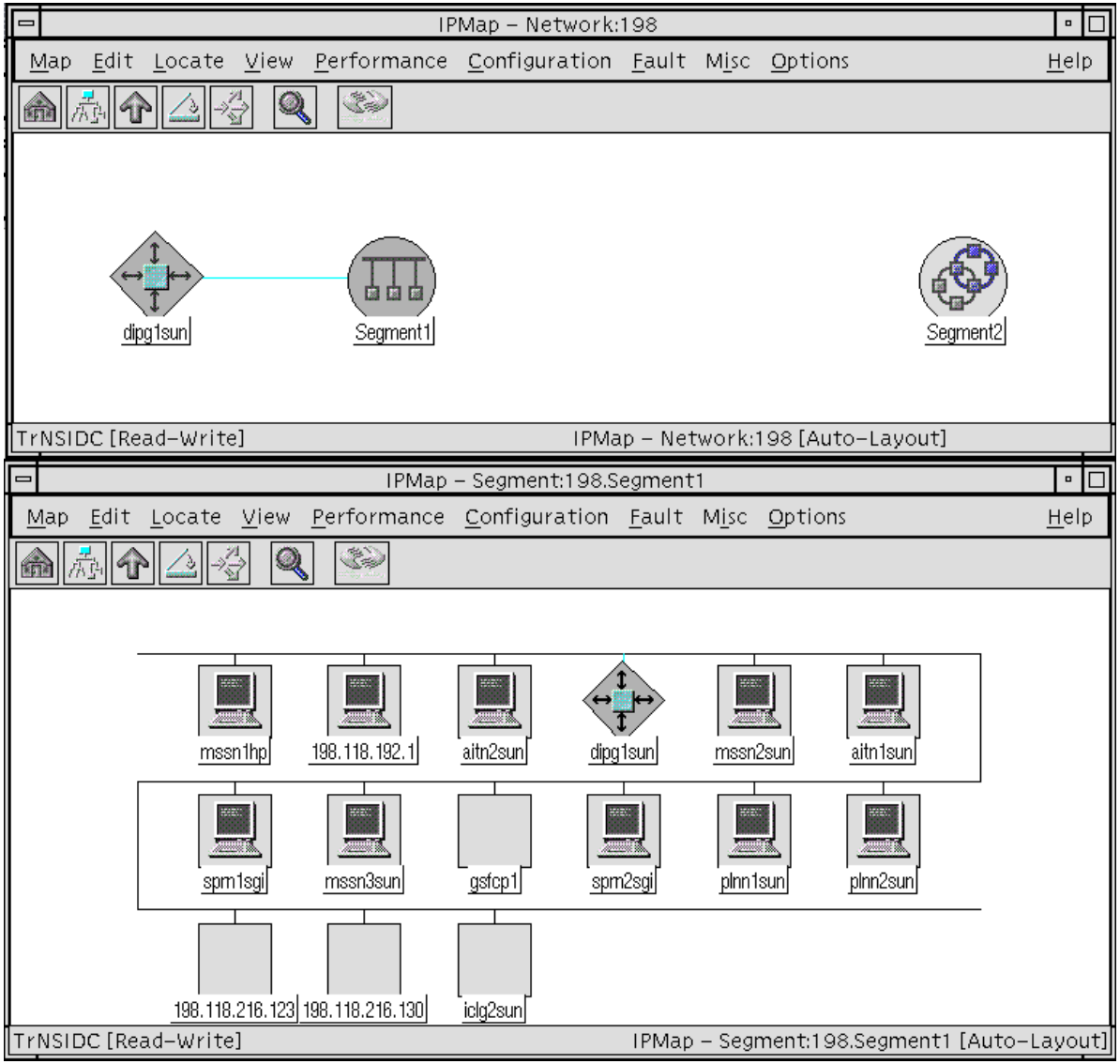
System Performance Monitoring

- **Maintaining Operational Readiness**
  - **System operators -- close monitoring of progress and status**
    - **Notice any serious degradation of system performance**
  - **System administrators and system maintenance personnel -- monitor overall system functions and performance**
    - **Administrative and maintenance oversight of system**
    - **Watch for system problem alerts**
    - **Use monitoring tools to create special monitoring capabilities**
    - **Check for notification of system events**

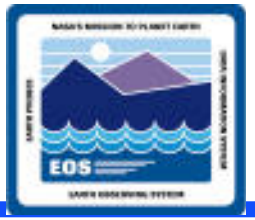
Checking Network Health & Status

- **HP Open View system management tool**
  - **Site-wide view of network and system resources**
  - **Status information on resources**
  - **Event notifications and background information**
  - **Operator interface for managing resources**
- **HP Open View monitoring capabilities**
  - **Network map with color alerts to indicate problems**
  - **Indication of network changes**
  - **Creation of submaps for special monitoring**
  - **Event notifications**

HP Open View Network Map



Network Discovery and Status



- **HP OpenView discovers and maps network and its elements**
  - **Configured to display status**
  - **Network maps set for read-write**
  - **IP Map application enabled**
- **HP OpenView Network Node Manager start-up**
  - **Starts ECS applications**
  - **Infrequent: While ECS is running, HP OpenView is active**
- **Status categories**
  - **Administrative: Not propagated**
  - **Operational: Propagated from child to parent**
- **Compound Status: How status is propagated**

HP OpenView Default Status Colors

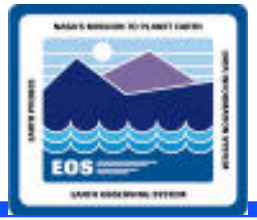
Status Condition	Symbol Color	Connection Color
Unmanaged (a)	Off-white	Black
Testing (a)	Salmon	Salmon
Restricted (a)	Tan	Tan
Disabled (a)	Dark Brown	Dark Brown
Unknown (o)	Blue	Black
Normal (o)	Green	Green
Warning (o)	Cyan	Cyan
Minor/Marginal (o)	Yellow	Yellow
Major (o)	Orange	Orange
Critical (o)	Red	Red

(a) Administrative Status (o) Operational Status

Monitoring: Check for Color Alerts

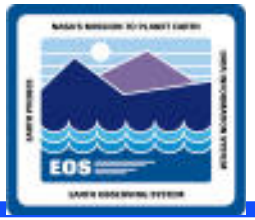
- Open a map
- Compound Status set to default
- Color indicates operational status
- Follow color indication for abnormal status to isolate problem

Monitoring: Check for New Nodes



- **IP Map application enabled**
  - **Automatic discovery of IP-addressable nodes**
  - **Creation of object for each node**
  - **Creation and display of symbols**
  - **Creation of hierarchy of submaps**
    - **Internet submap**
    - **Network submaps**
    - **Segment submaps**
    - **Node submaps**
- **Autolayout**
  - **Enabled: Symbols on map**
  - **Disabled: Symbols in New Object Holding Area**

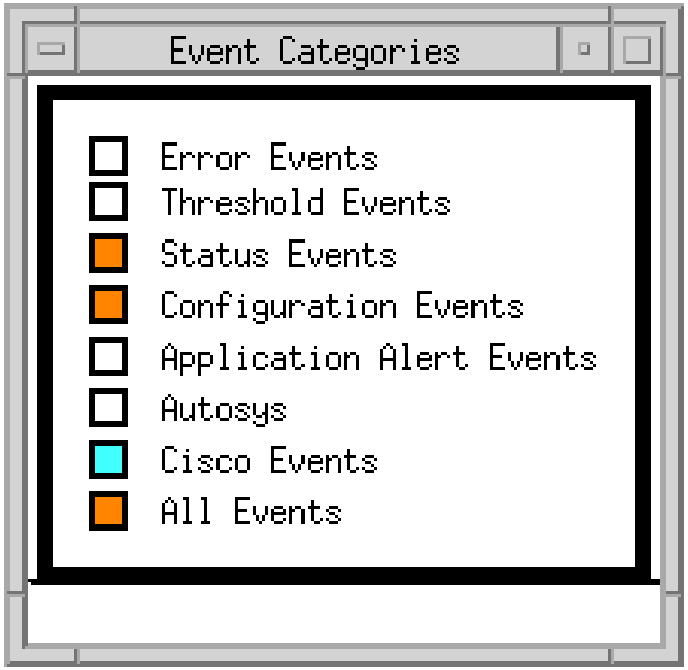
Monitoring: Special Submaps



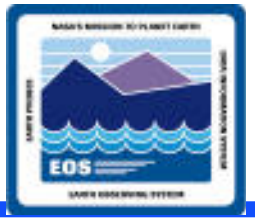
- **Logical *vs.* physical organization**
- **Create map tailored for special monitoring purpose**
- **Two types and access options**
  - **Independent of hierarchy, opened by menu and dialog**
  - **Child of a parent object, accessible through symbol on parent**

Monitoring: Event Notifications

- **Event: a change on the network**
  - **Registers in appropriate Events Browser window**
  - **Button color change in Event Categories window**
- **Event Categories**
  - **Error events**
  - **Threshold events**
  - **Status events**
  - **Configuration events**
  - **Application alert events**
  - **All events**

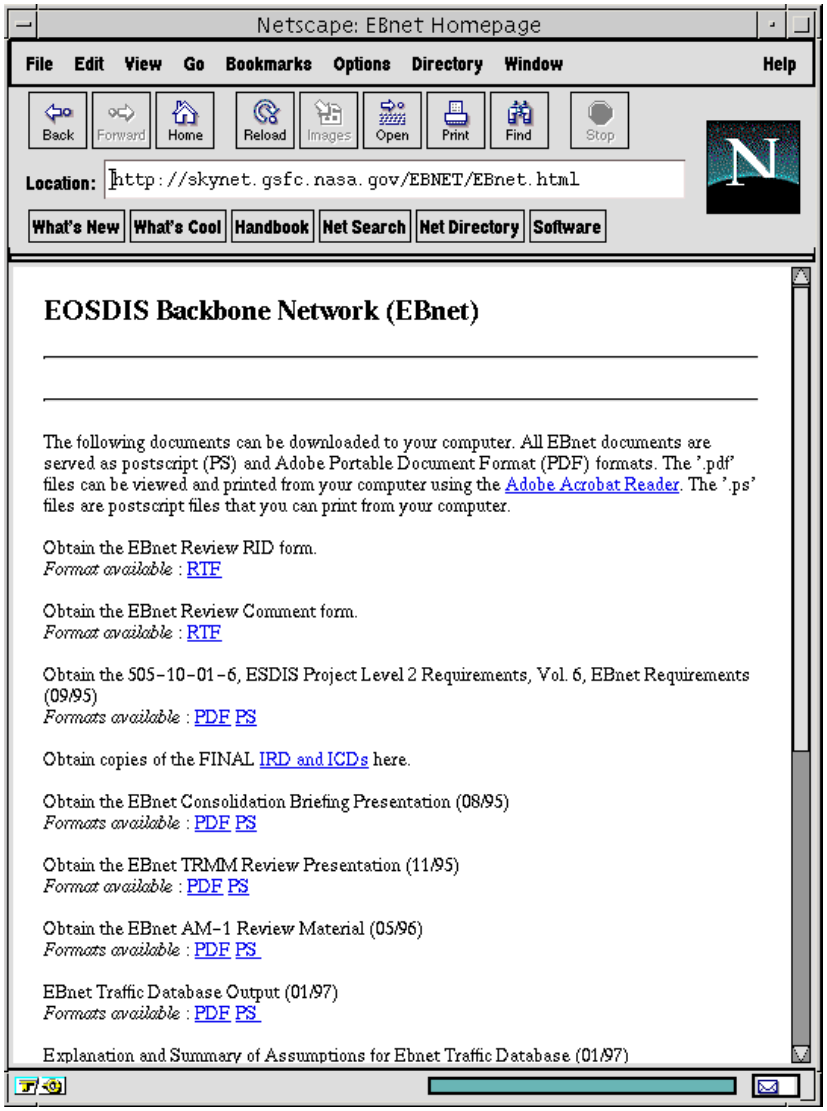


Accessing the EBnet Web Page



- **EBnet is a WAN for ECS connectivity**
  - **DAACs, EDOS, and other EOSDIS sites**
  - **Interface to NASA Science Internet (NSI)**
  - **Transports spacecraft command, control, and science data**
  - **Transports mission critical data**
  - **Transports science instrument data and processed data**
  - **Supports internal EOSDIS communications**
  - **Interface to Exchange LANs**
- **EBnet home page URL**
  - **http://skynet.gsfc.nasa.gov/EBNET/EBnet.html**

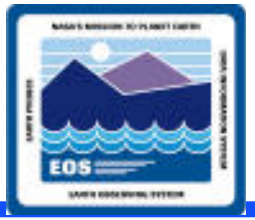
EBnet Home Page



Analysis/Troubleshooting: System

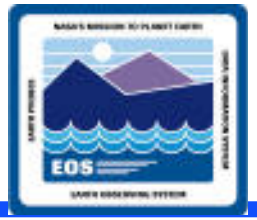
- **COTS product alerts and warnings**
  (e.g., HP OpenView, AutoSys/Xpert)
- **COTS product error messages and event logs**
  (e.g., HP OpenView, ClearCase,)
- **ECS Custom Software Error Messages**

Systematic Troubleshooting



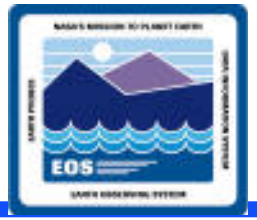
- **Thorough documentation of the problem**
  - **Date/time of problem occurrence**
  - **Hardware/software**
  - **Initiating conditions**
  - **Symptoms**
- **Verification**
  - **Identify/review relevant publications (e.g., COTS product manuals, ECS tools and procedures manuals)**
  - **Replicate problem**
- **Identification**
  - **Review product/subsystem logs**
  - **Review ECS error messages**
- **Analysis**
  - **Detailed event review (e.g., HP OpenView Event Browser)**
  - **Determination of cause/action**

Analysis/Troubleshooting: Hardware



- ECS hardware is COTS
- System troubleshooting principles apply
- HP OpenView for quick assessment of status
- HP OpenView Event Browser for event sequence
- Initial troubleshooting
  - Review error message against hardware operator manual; prepare trouble ticket
  - Verify connections (power, network, interface cables)
  - Run internal systems and/or network diagnostics
  - Review system logs for evidence of previous problems
  - Attempt system reboot
  - If problem is hardware, report it to the DAAC Maintenance Coordinator

Hardware Problems: (Continued)



- **Difficult problems may require team attack by Maintenance Coordinator, System Administrator, and Network Administrator:**
  - **specific troubleshooting procedures described in COTS hardware manuals**
  - **non-replacement intervention (e.g., adjustment)**
  - **replace hardware with maintenance spare**
    - **locally purchased (non-stocked) item**
    - **installed spares (e.g., RAID storage, power supplies, network cards, tape drives)**

Hardware Problems: (Continued)

- **If no resolution with local staff, maintenance support contractor may be called**
  - **Update trouble ticket with problem data, support provider data**
  - **Call technical support center**
  - **Facilitate site access by the technician**
  - **Update trouble ticket with data on the service call**
  - **If a part is replaced, additional data for trouble ticket**
    - **Part number of new item**
    - **Serial numbers (new and old)**
    - **Equipment Identification Number (EIN) of new item**
    - **Model number (Note: may require CCR)**
    - **Name of item replaced**

Non-Standard Hardware Support

- **For especially difficult cases, or if technical support is unsatisfactory**
  - **Escalation of the problem**
    - **Obtain attention of support contractor management**
    - **Call technical support center**
  - **Time and Material (T&M) Support**
    - **Last resort for mission-critical repairs**

Preventive Maintenance

- **Only element requiring PM initially is the EMASS robot**
  - **Scheduled by local Maintenance Coordinator**
  - **Coordinated with maintenance organization and using organization**
    - **Scheduled to be performed by maintenance organization and to coincide with any corrective maintenance if possible**
    - **Scheduled to minimize operational impact**
  - **Documented using a trouble ticket**

Trouble Ticket (TT)

- Documentation of system problems
- COTS Software (DDTS)
- Documentation of changes
- Failure Review Board
- Emergency fixes
- Configuration changes Æ CCR

Using DDTS

- **Creating and viewing Trouble Tickets or Non-Conformance Reports (NCRs)**
- **Modifying DDTS configuration and establishing privileges for DDTS users**
- **Generating problem reports**

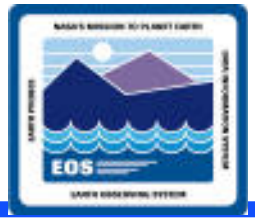
DDTS Configuration and Privileges

- ***DDTS Administrator's Manual, Release 3.2***
- **DDTS Administrator logs in as DDTS**
- **Use *adminbug* program set up projects**
  - ***aprj*** **-- add a project**
  - ***mprj*** **-- modify a project (e.g., add users)**

Operational Work-around

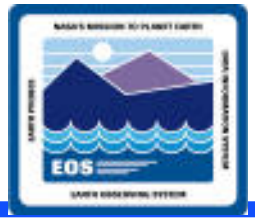
- Managed by the ECS Operations Coordinator at each center
- Master list of work-arounds and associated trouble tickets and configuration change requests (CCRs) kept in either hard-copy or soft-copy form for the operations staff
- Hard-copy and soft-copy procedure documents are “red-lined” for use by the operations staff
- Work-arounds affecting multiple sites are coordinated by the ECS organizations and monitored by ECS M&O Office staff

Diagnosing Network Problems



- **Network failures require same management as other failures**
  - **Detection of the fault**
  - **Isolation of the fault**
  - **Correction of the fault**
- **Standard troubleshooting tools apply**
  - **Error logs**
  - **Error detection processes**
  - **Diagnostic testing**

Identifying Connectivity Problems



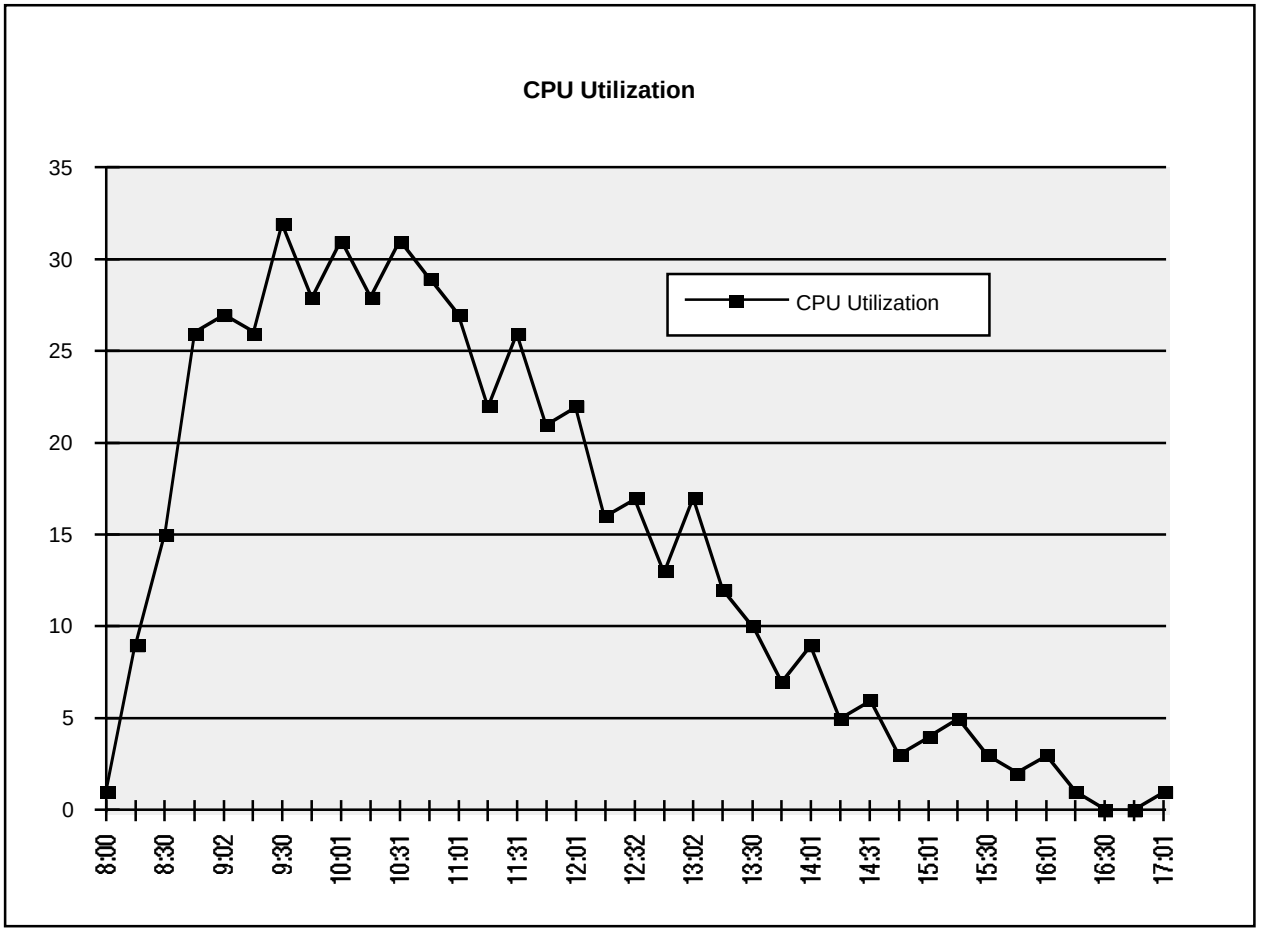
- **HP OpenView -- color of connections on maps**
  - **cyan: warning**
  - **yellow: minor**
  - **orange: major**
  - **red: critical**
- **HP OpenView Fault Diagnostic Aids**
  - **Ping**
  - **Remote Ping**
  - **Route Analysis**

Diagnosing Performance Problems

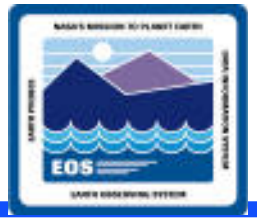
- **HP OpenView**
  - **Check interface traffic**
  - **Check CPU loading**

Example of HP OpenView Graphical Display of CPU Usage

	A	B
1	Time	CPU Utilization
2	8:00	1
3	8:15	9
4	8:30	15
5	8:46	26
6	9:02	27
7	9:15	26
8	9:30	32
9	9:45	28
10	10:01	31
11	10:16	28
12	10:31	31
13	10:45	29
14	11:01	27
15	11:16	22
16	11:31	26
17	11:46	21
18	12:01	22
19	12:16	16
20	12:32	17
21	12:46	13
22	13:02	17
23	13:16	12
24	13:30	10
25	13:45	7
26	14:01	9
27	14:15	5
28	14:31	6
29	14:45	3
30	15:01	4
31	15:16	5
32	15:30	3
33	15:47	2
34	16:01	3
35	16:16	1
36	16:30	0
37	16:47	0

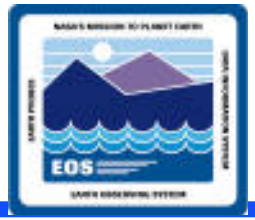


Diagnosing Network Service Problems



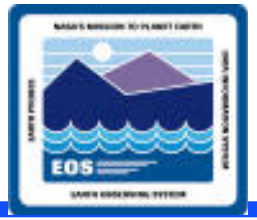
- **If unable to access a network service (e.g., ftp, telnet) on a remote system, use diagnostic procedure**
- **General Systematic Troubleshooting**
  - **Review Trouble Ticket**
  - **HP Open View**
    - **Look for color alerts**
    - **Locate relevant host**
    - **Check network activity, traffic on host**
    - **Check CPU load on host**

Viewing Historical Trends



- **HP OpenView Network Node Manager**
  - **Data collection**
  - **Event configuration**
  - **Application building**
- **Process**
  - **Establish baselines**
  - **Build applications to monitor trends**
  - **Establish and refine thresholds**
  - **Set up event-triggered actions**

Viewing Historical Trends (Cont.)



- **HP OpenView Grapher**
  - **Viewing of collected information in graph form**
  - **Graphing of combinations of data values**
  - **Viewing data values representing different instances of data variables or different variables for different nodes**
  - **Viewing data for selected nodes or viewing all the data in the Data Collector database**

Viewing Historical Trends (Cont.)

- **HP OpenView Event Log Browser**
  - **List events at or near the time of a problem**